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FORM PTO-1390 (REV. 9-2001) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY 'S DOCKET NUMBER	U.S. APPLICATION NO. (If known, see 37 CFR 1.5
P/1568-54	10/088779

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/EP00/08822	9 September 2000	24.9.1999 and 19.1.00

TITLE OF INVENTION: METHOD FOR THE HEAT TREATMENT OF STRUCTURE CASTINGS FROM AN ALUMINIUM ALLOY TO BE USED THEREFOR

APPLICANT(S) FOR DO/EO/US: Ulrich JERICHOW

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. [X] This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. [ ] This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. [ ] This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.
4. [X] The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. [X] A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. [ ] is attached hereto (required only if not communicated by the International Bureau).
   b. [X] has been communicated by the International Bureau.
   c. [ ] is not required, as the application was filed in the United States Receiving Office (RO/US).
6. [X] An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
   a. [X] is attached hereto.
   b. [ ] has been previously submitted under 35 U.S.C. 154(d)(4).
7. [ ] Amendments to the claims of the International Aplication under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. [ ] are attached hereto (required only if not communicated by the International Bureau).
   b. [ ] have been communicated by the International Bureau.
   c. [ ] have not been made; however, the time limit for making such amendments has NOT expired.
   d. [ ] have not been made and will not be made.
8. [ ] An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371 (c)(3)).
9. [X] An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. [X] An English lanugage translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)). (claims)

Items 11 to 20 below concern document(s) or information included:

11. [X] An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. [X] An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. [ ] A FIRST preliminary amendment.
14. [ ] A SECOND or SUBSEQUENT preliminary amendment.
15. [ ] A substitute specification.
16. [ ] A change of power of attorney and/or address letter.
17. [ ] A computer-readable form of the sequence listing in accordan
18. [ ] A second copy of the published international application und
19. [ ] A second copy of the English language translation of the inte
20. [X] Other items or information:
    PEFS print form.
    Post card

EXPRESS MAIL CERTIFICATE

I hereby certify that this correspondence is being deposited with the United States Postal Service as Express Mail Post Office Addressee (Mail Label EL 924372672 US) in an envelope addressed to: U.S. Patent and Trademark Office, PO Box 2327, Arlington, VA 22202, on March 20, 2002

Dorothy Jenkins
Name of Person Mailing correspondence

Dorothy Jenkins
Signature

March 20, 2002
Date of Signature

U.S. APPLICATION NO. (if known, see 37 CFR 1.5) 10/088779	INTERNATIONAL APPLICATION NO PCT/EP00/08822	ATTORNEY'S DOCKET NUMBER P/1568-54

21. [x] The following fees are submitted:

	CALCULATIONS PTO USE ONLY	
BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)):		
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO **$1040.00**		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO **$890.00**		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO **$740.00**		
International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) **$710.00**		
International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) **$100.00**		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$ 890.00	
Surcharge of **$130.00** for furnishing the oath or declaration later than [ ] 20 [ ] 30 months from the earliest claimed priority date (37 CFR 1.492(e)).	$	

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	15 - 20 =	0	x **$18.00**	$	
Independent claims	4 - 3 =	1	x **$84.00**	$ 84.00	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ **$280.00**	$	
TOTAL OF ABOVE CALCULATIONS =				$ 974.00	
[ ] Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2. +				$	
SUBTOTAL =				$ 974.00	
Processing fee of **$130.00** for furnishing the English translation later than [ ] 20 [ ] 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				$	
TOTAL NATIONAL FEE =				$ 975.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00** per property +				$ 40.00	
TOTAL FEES ENCLOSED =				$ 1,014.00	
				Amount to be refunded:	$
				charged:	$

a. [x] A check in the amount of $ 1,014. to cover the above fees is enclosed. Check No. 8801

b. [ ] Please charge my Deposit Account No. _____ in the amount of $ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. [x] The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 15-0700 . A duplicate copy of this sheet is enclosed.

d. [ ] Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card information should not be included on this form.** Provide credit card information and authorization on PTO-2038.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

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24,322
REGISTRATION NUMBER

P/1568-54

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of

Ulrich JERICHOW

Serial No.: Unassigned

Filed: Herewith

Date: March 20, 2002

Group Art Unit: Not yet known

Examiner: Not yet known

For: PROCESS FOR THE HEAT TREATMENT OF STRUCTURE CASTINGS MADE FROM AN ALUMINUM ALLOY TO BE USED FOR THIS PURPOSE

Assistant Commissioner for Patents
Washington, D.C. 20231

Attn: BOX PCT

PRELIMINARY AMENDMENT

Prior to examination, please amend the application as follows.

FEE CALCULATION

Any additional fee required has been calculated as follows:

_____ If checked, "Small Entity" status is claimed.

	NO. CLAIMS AFTER AMENDMENT		HIGHEST NO. PREVIOUSLY PAID FOR		EXTRA PRESENT		RATE	ADDIT. FEE
TOTAL	15	MINUS	20	* =	0	X	($9 SE or $18)	$-0-
INDEP.	4	MINUS	3	** =	1	X	($42 SE or $84)	$84.00
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM						X	($140 SE or $280)	$-0-
* not less than 20 ** not less than 3							TOTAL	$ $84.00

If any additional payment is required, a check which includes the calculated fee of $84.00 (OFGS Check No. 8801) is attached.

In the event the actual fee is greater than the payment submitted or is inadvertently not enclosed or if any additional fee during the prosecution of this application is not paid, the Patent Office is authorized to charge the underpayment to Deposit Account No. 15-0700.

CONTINGENT EXTENSION REQUEST

If this communication is filed after the shortened statutory time period had elapsed and no separate Petition is enclosed, the Commissioner of Patents and Trademarks is petitioned, under 37 C.F.R. § 1.136(a), to extend the time for filing a response to the outstanding Office Action by the number of months which will avoid abandonment under 37 C.F.R. § 1.135. The fee under 37 C.F.R. § 1.17 should be charged to our Deposit Account No. 15-0700.

AMENDMENTS

_X_ If checked, amendments to the specification and claims are submitted herewith.

1. Specification:

Please delete the paragraph(s)/section(s) beginning at page 7, line 5 to page 7, line 17, and replace such paragraph(s)/section(s) pursuant to 37 C.F.R. § 1.121(b)(ii) with the "clean" version attached hereto as Appendix A. Entry is respectfully requested. A version with markings to show the changes made pursuant to 37 C.F.R. § 1.121(b)(iii) is attached hereto as Appendix B.

Claims:

Please amend claims 1, 3-7 and add new claims 8-15 pursuant to 37 C.F.R. § 1.121(c)(i) as set forth in the "clean" version attached hereto as Appendix A. Entry is respectfully requested. A version with markings to show the changes made pursuant to 37 C.F.R. § 1.121(c)(ii) is attached hereto as Appendix B.

REMARKS/ARGUMENT

The original claims have been replaced with claims in better form for U.S. practice. The original claims have not been narrowed by this Amendment, but rather have been restated in U.S. form.

The replacement claims eliminate multiple dependent claims for reducing the official filing fee.

I hereby certify that this correspondence is being deposited with the United States Postal Service as Express Mail Post Office Addressee (Mail Label EL 924372672 US in an envelope addressed to: U.S. Patent and Trademark office, PO Box 2327, Arlington, VA 22202, on March 20, 2002:

Dorothy Jenkins

Name of Person Mailing Correspondence

Dorothy Jenkins

Signature

March 20, 2002

Date of Signature

RCF:mcm:dmk

Respectfully submitted,

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APPENDIX A

"CLEAN" VERSION OF EACH PARAGRAPH/SECTION/CLAIM
37 C.F.R. § 1.121(b)(ii) AND (c)(i)

SPECIFICATION:

Replacement for the paragraph beginning at page 7, line 5 to page 7, line 17:

the following mechanical properties were achieved after a heat treatment:

Heat treatment	Rp0.2 in MPa	A5 in %
1st stage 490°C approx 90 min 2nd stage 250°C approx 105 min	120-130	12-15
1st stage 490°C approx 90 min 2nd stage 250°C approx 75 min	130-135	11-13
1st stage 490°C approx 90 min 2nd stage 250°C approx 45 min	140-145	8-10
1st stage 490°C approx 90 min 2nd stage 250°C approx 30 min	145-150	8-10
1st stage 490°C approx 90 min 2nd stage 250°C approx 30 min	145-150	8-10

wherein Rp0.2 means yield strength at 0.2% permanent elongation; MPa means 10^6Pascal and A5% means elongation at break with a sample having a rational length of measurement to diameter of Lo=5do.

CLAIMS (with indication of amended or new):

AMENDED 1. A process for the heat treatment of structure castings made from an aluminum alloy, comprising the steps of:

- placing the structure casting onto a contour-embracing product receiving device,
- heating the casting to 490°C over the course of approximately 30 minutes,
- holding the temperature of 490°C for a time of between 60 and 90 minutes,

- quenching in air from 490°C to approximately 100°C over the course of approximately 4 minutes,
- heating to 250°C over the course of approximately 15 minutes,
- holding the temperature of 250°C for a time of between 30 and 105 minutes,
- quenching in air to 40°C.

AMENDED 3. The process as claimed in claim 1, in which the temperature of 490°C is held for approximately 90 minutes, and the temperature of 250°C is held for approximately 30 minutes.

AMENDED 4. An aluminum alloy for use in a process of heat treatment, having the following composition:

Si: 2-11.5%

Fe: 0.15–0.4%

Mg: 0.3–1.0%

Cu: <0.02%

Mn: 0.4-0.8%

Ti: 0.1-0.2%

remainder aluminum and trace elements.

AMENDED 5. An aluminum alloy for use in a process of heat treatment, having the following composition:

Si: 1-3%

Fe: 0.15-0.4%

Mg: 3-5.5%

Cu: <0.02%

Mn: 0.4-0.8%

Ti: 0.1-0.2%

Zn: <0.08%

remainder aluminum and trace elements.

AMENDED 6. An aluminum alloy for use in a process of heat treatment, having the following composition:

Si: 7-11.5%

Fe: 0.15-0.4%

Mg: 0.3-0.4%

Cu: <0.02%

Mn: 0.4-0.6%

Ti: 0.15-0.2%

Sr: up to 300 ppm

remainder aluminum and trace elements.

AMENDED 7. The process as claimed in claim 1, further comprising, before introducing the structure casting into the casting process, subjecting the aluminum alloy to a melt treatment.

NEW 8. The process as claimed in Claim 7, wherein the melt treatment is degassing.

NEW 9. The process as claimed in Claim 7, wherein the melt treatment is filtration.

NEW 10. The process as claimed in Claim 1, further comprising after the first quenching in air, quenching in water.

NEW 11. The process as claimed in Claim 1, further comprising after the second quenching in air, quenching in water.

NEW 12. The process as claimed in Claim 1, further comprising after each quenching in air, quenching in water.

NEW 13. The process as claimed in claim 1, in which the temperature of 490°C is held for approximately 90 minutes, and the temperature of 250°C is held for approximately 45 minutes.

NEW 14. The process as claimed in claim 1, in which the temperature of 490°C is held for approximately 90 minutes, and the temperature of 250°C is held for approximately 60 minutes.

NEW 15. The process as claimed in claim 1, in which the temperature of 490°C is held for approximately 90 minutes, and the temperature of 250°C is held for approximately 105 minutes.

APPENDIX B

VERSION WITH MARKINGS TO SHOW CHANGES MADE
37 C.F.R. § 1.121(b)(iii) AND (c)(ii)

SPECIFICATION

Replacement for the paragraph beginning at page 7, line 5 to page 7, line 17:

the following mechanical properties were achieved after a heat treatment:

Heat treatment	Rp0.2 in MPa	A5 in %
1st stage 490°C approx 90 min 2nd stage 250°C approx 105 min	120-130	12-15
1st stage 490°C approx 90 min 2nd stage 250°C approx 75 min	130-135	11-13
1st stage 490°C approx 90 min 2nd stage 250°C approx 45 min	140-145	8-10
1st stage 490°C approx 90 min 2nd stage 250°C approx 30 min	145-150	8-10
1st stage 490°C approx 90 min 2nd stage 250°C approx 30 min	145-150	8-10

wherein Rp0.2 means yield strength at 0.2% permanent elongation; MPa means 10^6Pascal and A5% means elongation at break with a sample having a rational length of measurement to diameter of Lo=5do.

CLAIMS:

AMENDED 1. A process for the heat treatment of structure castings made from an aluminum alloy, comprising the steps of:

- placing the structure casting onto a contour-embracing product receiving device,
- heating the casting to 490°C over the course of approximately 30 minutes,
- holding the temperature of 490°C for a time of between 60 and 90 minutes,
- quenching in air from 490°C to approximately 100°C over the course of approximately 4 minutes[, if appropriate followed by quenching in water],

- heating to 250°C over the course of approximately 15 minutes,
- holding the temperature of 250°C for a time of between 30 and 105 minutes,
- quenching in air to 40°C[, if appropriate followed by quenching in water]:

AMENDED 3. The process as claimed in claim 1, in which the temperature of 490°C is held for approximately 90 minutes, and the temperature of 250°C is held for approximately 30 minutes[or approximately 45 minutes or approximately 60 minutes or approximately 105 minutes].

AMENDED 4. An aluminum alloy for use [with the] <u>in a</u> process <u>of heat treatment</u>[as claimed in claim 1, 2 or 3], having the following composition:

Si: 2-11.5%

Fe: 0.15–0.4%

Mg: 0.3–1.0%

Cu: <0.02%

Mn: 0.4-0.8%

Ti: 0.1-0.2%

remainder aluminum and trace elements.

AMENDED 5. An aluminum alloy for use [with the] <u>in a</u> process [as claimed in claim 1, 2 or 3] <u>of heat treatment</u>, having the following composition:

Si: 1-3%

Fe: 0.15-0.4%

Mg: 3-5.5%

Cu: <0.02%

Mn: 0.4-0.8%

Ti: 0.1-0.2%

Zn: <0.08%

remainder aluminum and trace elements.

AMENDED 6. An aluminum alloy for use [with the] in a process [as claimed in claim 1, 2 or 3] of heat treatment, having the following composition:

Si: 7-11.5%

Fe: 0.15-0.4%

Mg: 0.3-0.4%

Cu: <0.02%

Mn: 0.4-0.6%

Ti: 0.15-0.2%

Sr: up to 300 ppm

remainder aluminum and trace elements.

AMENDED 7. The [aluminum alloy] process as claimed in claim 1, further comprising [4, 5 or 6, which], before [being introduced] introducing the structure casting into the casting process, [has been subjected] subjecting the aluminum alloy to a melt treatment[, such as degassing and/or filtration].

Title: Process for the heat treatment of structure castings made from an aluminum alloy to be used for this purpose

Abstract

A process for the heat treatment of structure castings made from an aluminum alloy, comprising the steps of: placing the structure casting onto a contour-embracing product receiving device, heating to 490°C over the course of approximately 30 minutes, holding the temperature of 490°C for a time of between 90 and 120 minutes, quenching in air from 490°C to approximately 100° over the course of approximately 4 minutes, if appropriate followed by quenching in water, heating to 250°C over the course of approximately 15 minutes, holding the temperature of 250°C for a time of between 30 and 120 minutes, quenching in air to 40°C, if appropriate followed by quenching in water; a light metal alloy for use with this process, having the following composition: Si: 2-11.5%, Fe: 0.15-0.4%, Mg: 0.3-5.5%, Cu & It: 0.02%, Mn: 0.4-0.8%, Ti: 0.1-0.2%, remainder aluminum and trace elements, the alloys with a high silicon content having a low magnesium content and vice versa.

"Process for the heat treatment of structure castings made from an aluminum alloy to be used for this purpose"

The invention relates to a process for the heat treatment of structure castings made from an aluminum alloy and to an aluminum alloy to be used for this purpose.

Aluminum structure castings made from an aluminum alloy are used, for example, in the automotive industry and should have good mechanical properties, in particular a high elongation at break, good castability, no tendency to stick in the mold and good mold-release properties, a high design strength and good weldability. Since the known aluminum casting alloys do not have the required properties in the cast state, heat treatment processes and aluminum alloys have been developed to enable industrial requirements to be satisfied to an ever more accurate and less expensive extent. Special heat treatment processes designated T64 and T7 have become known for this process. These heat treatment processes are described, for example, in "Das Techniker Handbuch" [The Engineering Handbook] Böge, Vieweg, 13th Edition, pages 551 to 554. These heat treatment processes involve a two-stage procedure as detailed below:

T64 (thermally unstable):

1st stage: Heating to 480 to 520°C, holding for 2 to 5 hours, quenching in water at 20°C;

2nd stage: Heating to 155 to 170°C, holding for 2 to 6 hours, quenching in air.

T7 (thermally stable up to 230°C):

1st stage: heating to 480 to 520°C, holding for 2 to 5 hours, quenching in water at 20°C.

2nd stage: heating to 200 to 230°C, holding for 2 to 3 hours, quenching in air.

The structure castings which have been treated using the heat treatment process T64 are not thermally stable at elevated temperatures, but castings which have been treated using heat treatment process T7 are stable at elevated temperatures. A drawback of both heat treatment processes T64 and T7 is that the structure castings produced by means of the die-casting process lose their extremely high dimensional accuracy which is present in the cast state, on account of the high thermal stress states which occur in the structure casting during the quenching in water. The structure castings are dimensionally unstable after the first heat treatment stage and have to be

dimensionally accurate by expensive and complicated straightening operations. This problem is particularly acute in structure components, since these structure castings have a high level of complexity and integrity and have to satisfy high demands imposed on the dimensional accuracy.

The invention is therefore based on the problem of providing a heat treatment process which can be used to achieve good mechanical properties and a high dimensional accuracy at low cost and by simple means.

Working on the basis of this problem, the invention proposes a process for the heat treatment of structure castings made from an aluminum alloy, which comprises the steps of:

- placing the structure casting onto a contour-embracing product receiving device,
- heating to 490°C over the course of approximately 30 minutes,
- holding the temperature of 490°C for a time of between 60 and 90 minutes,
- quenching in air from 490°C to approximately 100°C over the course of approximately 4 minutes, if appropriate followed by quenching in water,
- heating to 250°C over the course of approximately 15 minutes,
- holding the temperature of 250°C for a time of between

30 and 120 minutes,

- quenching in air to 40°C, if appropriate followed by quenching in water.

Preferably, the temperature of 490°C can be held for approximately 60 minutes, and the temperature of 250°C can be held for approximately 30 minutes.

If, according to a second process variant, the temperature of 490°C is held for approximately 90 minutes, the temperature of 250°C can be held for approximately 30 minutes or approximately 45 minutes or approximately 75 minutes or approximately 105 minutes, with the result that the mechanical properties can be varied according to the spectrum of requirements.

A suitable aluminum alloy for use with the process according to the invention may have the following composition:

Si: 5-11.5%

Fe: 0.15-0.4%

Mg: 0.3-1.0%

Cu: <0.02%

Mn: 0.4-0.8%

Ti: 0.1-0.2%

Remainder: aluminum and trace elements.

A suitable Al-Mg alloy may have the following composition:

Si: 1-3%

Fe: 0.15-0.4%

Mg: 3-5.5%

Cu: <0.02%

Mn: 0.4-0.8%

Ti: 0.1-0.2%

Zn: <0.08%

Remainder: aluminum and trace elements.

A suitable eutectic or almost-eutectic Al-Si alloy may have the following composition:

Si: 7-11.5%

Fe: 0.15%-0.4%

Mg: 0.3-0.4%

Cu: <0.02%

Mn: 0.4-0.6%

Ti: 0.15-0.2%

Sr: up to 300 ppm

Remainder: aluminum and trace elements.

These alloys are subjected to a melt treatment, such as degassing and/or filtration, before being introduced into the casting process. The vacuum which is generated in the die cavity during die casting at the time of introduction of the

molten aluminum alloy is 50 to 150 mbar.

The cast structure castings are placed onto special contour-embracing product receiving devices and are subjected to the heat treatment steps described above.

The result of these heat treatments is that the distortion of the structure casting is considerably lower than with the heat treatment according to T64 or T7.

Moreover, the service life of the contour-embracing product receiving devices that are used is extended, on account of the thermal stresses during quenching in air being reduced greatly, by a multiple.

Furthermore, it has been established that the Fe content of 0.15 to 0.4% achieves a lasting improvement to the tool service life, which is unsatisfactory with Fe contents of <0.15% in commercially available alloys for the structure casting sector. No adverse effects on the dynamic and static characteristic values were recorded.

With an aluminum alloy of the following composition:

Si: 9.5-11.5%

Fe: 0.15-0.4%

Mg: 0.3-0.4%

Cu: <0.02%

Mn: 0.4-0.6%

Ti: 0.15-0.2%

Remainder: aluminum and trace elements

the following mechanical properties were achieved after a heat treatment:

Heat treatment	Rp0.2 in MPa	A5 in %
1st stage 490°C approx 90 min 2nd stage 250°C approx 105 min	120-130	12-15
1st stage 490°C approx 90 min 2nd stage 250°C approx 75 min	130-135	11-13
1st stage 490°C approx 90 min 2nd stage 250°C approx 45 min	140-145	8-10
1st stage 490°C approx 90 min 2nd stage 250°C approx 30 min	145-150	8-10
1st stage 490°C approx 90 min 2nd stage 250°C approx 30 min	145-150	8-10

While the process T64 requires a minimum heat treatment time of 4 hours and a maximum treatment time of 11 hours, and the heat treatment process T7 requires a minimum heat treatment time of likewise 4 hours and a maximum heat treatment time of 8 hours, the process according to the invention lasts at most 3.25 hours, but in the most expedient situation can be

shortened to as little as 1.5 hours. Therefore, the process according to the invention is generally more economical, on account of the shorter cycle time. Furthermore, the thermal stability is improved, on account of the temperature in the second stage having been increased by approximately 30°C compared to heat treatment process T7 and by approximately 80°C compared to heat treatment process T64, so that the structure castings which have been heat-treated using the process according to the invention are thermally stable up to use temperatures of 250°C.

The aluminum alloys according to the invention for use with the process according to the invention make it possible to produce very thin-walled, large-area and complex structure castings, the mold strength and dimensional accuracy of which is ensured by the heat treatment process according to the invention. Accordingly, the process according to the invention and the alloy used with this process provide the designer with considerable design freedom. The process according to the invention and the aluminum alloys used therewith make it possible to ensure uniform quality in mass production, high ductility, good weldability and therefore the possibility of joining to metal sheets or extruded sections.

8020PCT

Honsel Guss GmbH

Patent Claims

1. A process for the heat treatment of structure castings made from an aluminum alloy, comprising the steps of:

- placing the structure casting onto a contour-embracing product receiving device,
- heating to 490°C over the course of approximately 30 minutes,
- holding the temperature of 490°C for a time of between 60 and 90 minutes,
- quenching in air from 490°C to approximately 100°C over the course of approximately 4 minutes, if appropriate followed by quenching in water,
- heating to 250°C over the course of approximately 15 minutes,
- holding the temperature of 250°C for a time of between 30 and 105 minutes,
- quenching in air to 40°C, if appropriate followed by quenching in water.

2. The process as claimed in claim 1, in which the temperature of 490°C is held for approximately 60 minutes, and the temperature of 250°C is held for approximately 30 minutes.

3. The process as claimed in claim 1, in which the temperature of 490°C is held for approximately 90 minutes, and the temperature of 250°C is held for approximately 30 minutes or approximately 45 minutes or approximately 60 minutes or approximately 105 minutes.

4. The process as claimed in one of claims 1-3 using an aluminum alloy, having the following composition:

Si: 2-11.5%

Fe: 0.15-0.4%

Mg: 0.3-1.0%

Cu: <0.02%

Mn: 0.4-0.8%

Ti: 0.1-0.2%

remainder aluminum and trace elements.

5. The process as claimed in one of claims 1-3 using an aluminum alloy, having the following composition:

Si: 1-3%

Fe: 0.15-0.4%

Mg: 3-5.5%

Cu: <0.02%

Mn: 0.4-0.8%

Ti: 0.1-0.2%

Zn: <0.08%

remainder aluminum and trace elements.

6. The process as claimed in one of claims 1-3 using an aluminum alloy, having the following composition:

Si: 7-11.5%

Fe: 0.15-0.4%

Mg: 0.3-0.4%

Cu: <0.02%

Mn: 0.4-0.6%

Ti: 0.15-0.2%

Sr: up to 300 ppm

remainder aluminum and trace elements.

7. The process as claimed in one of claims 4-6, in which the aluminum alloy, before being introduced into the casting process, has been subjected to a melt treatment, such as degassing and/or filtration.

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Zur Erklärung der Zweibuchstaben-Codes, und der anderen Abkürzungen wird auf die Erklärungen ("Guidance Notes on Codes and Abbreviations") am Anfang jeder regulären Ausgabe der PCT-Gazette verwiesen.

(54) Title: METHOD FOR THE HEAT TREATMENT OF STRUCTURE CASTINGS FROM AN ALUMINIUM ALLOY TO BE USED THEREFOR

(54) Bezeichnung: VERFAHREN ZUR WÄRMEBEHANDLUNG VON STRUKTURGUSSTEILEN AUS EINER DAFÜR ZU VERWENDENDEN ALUMINIUMLEGIERUNG

(57) Abstract: The invention relates to a method for the heat treatment of structure castings from an aluminium alloy. The inventive method comprises the steps: laying the structure casting onto a product receiving device that embraces the contours of said casting, heating up to 490 °C in approximately 30 minutes, maintaining the temperature of 490 °C for between 90 and 120 minutes, chilling in air from 490 °C to approximately 100 °C for approximately 4 minutes and optionally and subsequently chilling in water, heating up to 250 °C in approximately 15 minutes, maintaining the temperature of 250 °C for between 30 and 120 minutes, chilling in air to 40 °C and optionally and subsequently chilling in water. The invention also relates to a light-metal alloy for the use in said method. Said alloy has the following composition: Si: 2-11.5 %, Fe: 0.15-0.4 %, Mg: 0.3-5.5 %, Cu: <0.02 %, Mn: 0.4-0.8 %, Ti: 0.1-0.2 %, the rest being aluminium and trace elements, whereby the alloys having a high content of silicon are provided with low contents of magnesium and vice versa.

(57) Zusammenfassung: Verfahren zur Wärmebehandlung von Strukturgussteilen aus einer Aluminiumlegierung mit den Schritten: Auflegen des Strukturgussteils auf eine konturgreifende Produktaufnahme, Aufheizen auf 490 °C in etwa 30 Minuten, Halten der Temperatur von 490 °C während einer Zeit zwischen 90 und 120 Minuten, Abschrecken in Luft in etwa 4 Minuten von 490 °C auf etwa 100 °C und ggf. anschliessendes Abschrecken in Wasser, Aufheizen auf 250 °C in etwa 15 Minuten, Halten der Temperatur von 250 °C während einer Zeit zwischen 30 und 120 Minuten, Abschrecken in Luft auf 40 °C und ggf. anschliessendes Abschrecken in Wasser; Leichtmetallegierung zur Verwendung mit diesem Verfahren mit der Zusammensetzung Si: 2-11,5 %, Fe: 0,15-0,4 %, Mg: 0,3-5,5 %, Cu: & lt;0,02 %, Mn: 0,4-0,8 %, Ti: 0,1-0,2 %, Rest Aluminium und Spurenelemente, wobei die Legierungen mit hohem Siliziumgehalt niedrige Magnesiumgehalte aufweisen und umgekehrt.

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UNITED STATES OF AMERICA COMBINED DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION	OFGS FILE NO. P/1568-54

As a below named inventor, I hereby declare that: my residence, post office address and citizenship are as stated below next to my name; that I verily believe that I am the original, first and sole inventor (if only one name is listed below) or a joint inventor (if plural inventors are named) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

PROCESS FOR THE HEAT TREATMENT OF STRUCTURE CASTINGS MADE FROM AN ALUMINUM ALLOY TO BE USED FOR THIS PURPOSE

the specification of which is attached hereto, unless the following box is checked:

☒ was filed on 9 September 2000 as United States patent Application Number or PCT International patent application number PCT/EP00/08822 and was amended on 31 August 2001 (if any).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose all information known to be material to patentability in accordance with Title 37, Code of Federal Regulations, §1.56.

I hereby claim priority benefits under Title 35, United States Code §119 of any foreign application(s) for patent or inventor's certificate or United States provisional application(s) listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign or Provisional Application(s)

COUNTRY	APPLICATION NUMBER	DATE OF FILING *(day, month, year)*	PRIORITY CLAIMED UNDER 35 U.S.C. 119
Germany	199 45 754.9	24 September 1999	YES X NO ___
Germany	100 02 021.6	19 January 2000	YES X NO ___

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

UNITED STATES APPLICATION NUMBER	DATE OF FILING *(day, month, year)*	STATUS *(patented, pending, abandoned)*

I hereby appoint customer no. 2352 OSTROLENK, FABER, GERB & SOFFEN, LLP. and the members of the firm, Samuel H. Weiner - Reg. No. 18,510; Jerome M. Berliner - Reg. No. 18,653; Robert C. Faber - Reg. No. 24,322; Max Moskowitz - Reg. No. 30,576; James A. Finder - Reg. No. 30,173; William O. Gray, III - Reg. No. 30,944; Louis C. Dujmich - Reg. No. 30,625; and Douglas A. Miro - Reg. No. 31,643; as attorneys with full power of substitution and revocation to prosecute this application, to transact all business in the Patent & Trademark Office connected therewith and to receive all correspondence.

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